

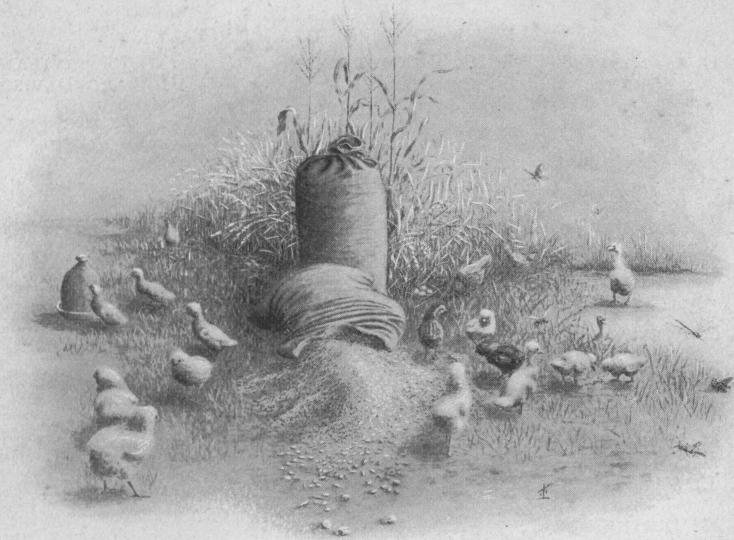
POPULAR EDITION.

BULLETIN No. 171.

DECEMBER, 1899

New York Agricultural Experiment Station.

GENEVA, N. Y.



WHAT GRAINS LACK AS POULTRY FOODS.

F. H. HALL AND W. P. WHEELER.

PUBLISHED BY THE STATION.

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* Connected with Fertilizer Control.

† Connected with Second Judicial Department Branch Station.

POPULAR EDITION*

OF

BULLETIN No. 171.

WHAT GRAINS LACK AS POULTRY FOODS

F. H. HALL.

Grains alone make poor poultry rations. This **Not perfect foods.** was proven by tests made at the Station in 1898; and the truth has been confirmed by weighty evidence from numerous and extensive trials completed in 1899. The best grains, in most palatable combinations—"Regular hotel fare for variety," as described by a well-known poultry feeder—and made up in rations properly balanced according to the best ideas in poultry nutrition, showed a deficiency in growth-making, egg-producing power.

OLD TESTS.

In the preliminary experiments, reported in Bulletin 149, this lack of some factor—some chemical element, or some peculiar quality—was shown in tests with chicks, cockerels and ducks. The rations compared were made up entirely of grains, on one hand; of grains, meat meal and other animal foods on the other. Some skim milk and green stuff were added to both. The contrasted rations had approximately the same chemical composition, so far as protein and carbohydrates are concerned, and the same nutritive ratio.

* This is a brief review of Bulletin No. 171 of this Station on Animal Food for Poultry, by W. P. Wheeler. Anyone specially interested in the detailed account of the investigations, will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed upon the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.

The larger protein supply in the animal-food ration was counter-balanced in the grain ration by increased amounts of pea meal, linseed meal, gluten meal and ground oats, which are rich in this flesh-forming element of nutrition.

Notwithstanding the almost complete equality of the rations, so far as nutritive ratio are concerned, the animal-food ration gave the best results. Upon it the chicks grew much faster and gained more flesh for the same amounts of food given; the cockerels also did better upon the meat meal than upon grains alone, so long as they made profitable growth at all; and the ducks thrived and grew rapidly in the pens fed the meat meal, dried blood or cut bone; while growth was slow and deaths frequent in the pens where grains alone were fed.

Though most carefully conducted and most striking in its results, this series of tests was not conclusive. It is a maxim of careful investigation that "One and only one cause of variation can be allowed in any comparative test of materials if absolute accuracy is secured." That is, for example, if we wish to know whether *clay* loam or *sandy* loam is best for the growth of strawberries, we must make *all* conditions alike for the plants except the soil. The same variety must be grown on equal plats or boxes, side by side to secure uniform light and heat; equal amounts of the same fertilizers must be used; and the plants must receive the same amounts of water. Even then, if one of the two plats or boxes is nearer a bed of vigorous plants of some other variety the difference in yield may be due partly to better pollination, not to soil difference alone. *Every* condition must be alike for both, except that condition of which the influence is considered.

This careful weeding out of factors which may influence results makes securing certainty through experimentation a slow matter; and in no class of work must so many things be considered as in feeding experiments.

In this test, for instance, the materials were so proportioned that all the commonly considered food compounds were equal in amount, their source, only, different; the birds fed were alike in breed and methods of hatching and brooding; equal in number,

Unlike factors.

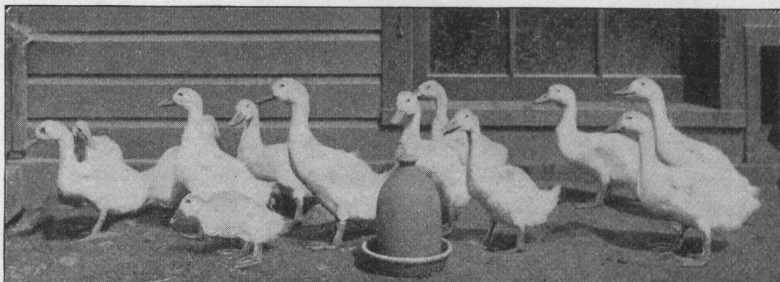
age and weight; and subject to the same conditions of housing, care, watering and all controllable factors. The experimenter might well seem justified in saying that the good effect of the one ration was due to the fact that part of the protein in this ration came from animal food.

Careful study of the chemical analyses, however, showed that the two sets of rations differed in one other particular. The meat-meal ration contained much more of the *ash* or mineral elements than did the rations made up of grain alone. Mineral matter forms a large part of the animal body and must be considered in the food, especially of the young animal; therefore this discrepancy could not be set aside. So long as the *two* possible causes of variation were present—different sources of protein and different amounts of ash—it was impossible to say to *which* factor was due the better effect of the animal food ration. In these trials also, some skim milk and curd had been used with the grain ration; so the comparison was not *strictly* between grains alone and grains with animal food. As milk is an animal product there was a little animal matter even in the "all-grain" ration.

NEW TESTS.

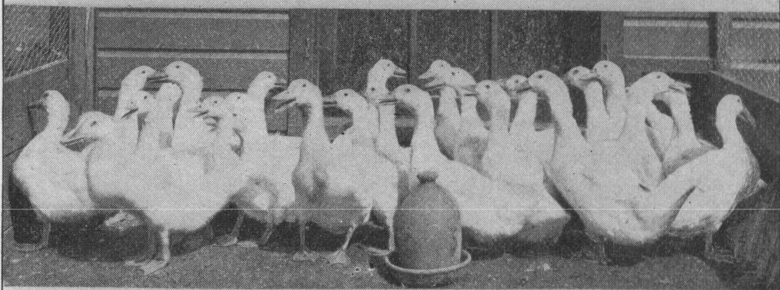
Ash unequal.

To meet these conditions other experiments had been planned and were carried out in 1898 and 1899. In the first series similar contrasted rations were used as in the tests reported in Bulletin 149; but the foods were somewhat differently combined to secure greater palatability for the ration made up wholly of grains. The amount of ash in the two rations was still unlike. One ration for chicks and hens consisted of wheat, cracked corn, barley, oats and a mixture made up of corn meal (14 parts by weight), animal meal (11), ground oats (2), wheat bran (2), pea meal (2), wheat middlings (1), O. P. linseed meal (1), malt sprouts (1), brewer's grains (1) and gluten meal (1). The contrasted ration, grains only, consisted of wheat, barley, oats, and a mixture of pea meal (7) wheat bran (7), O. P. linseed meal (6), gluten meal (4), corn meal (3), ground oats (3), malt sprouts (2), brewer's grains (2) and wheat middlings (2). One pound of salt



DUCKLINGS OF LOT B — NINE WEEKS OLD .

AVERAGE WT. = 2 POUNDS . VEGETABLE FOOD ONLY FOR PART
OF THE TIME HALF OF THE NUMBER DIED BEFORE OTHER FOOD WAS
SUPPLIED



DUCKLINGS OF LOT A — NINE WEEKS OLD .

AVERAGE WT. 4.2 POUNDS . THE RATION CONTAINED ANIMAL FOOD .
NO LOSS .

was used for each 360 pounds of each mixture. For the ducklings, wheat bran, corn meal and ground oats were used with one or the other of the mixtures.

Five lots of chicks were fed upon each ration, and in every case the lot fed upon grains alone required more dry matter in the food for each pound of gain than did the corresponding lot fed on the ration composed in part of animal meal. The same result held true with the four lots of laying hens compared ; for it took more grain to produce a pound of eggs than it did grain and meat meal. The average with both chicks and hens was nearly one fourth (23 per ct.) more food required on grains alone, for each pound of flesh or eggs, than on the animal meal ration.

The difference was much more striking in the case of the ducklings ; for here animal meal seems a *necessity*. The ducklings under the other ration died so rapidly that the test had to be continued in a changed form after four weeks, some animal food being given to the lot started on grain alone. Up to the time the change was made it took $2\frac{1}{3}$ times as much food for a pound of gain for the grain-fed birds as for the others.

In the second series of experiments, the proportions of the ingredients were slightly altered in each ration ; but the contrast was still maintained between all-grain and part grain, part animal meal. To supply the mineral matter which was lacking in the all-grain ration, bones were burned to get rid of all organic matter, and the fine ash was added in sufficient amount to make the weight of ash in the two rations practically equal.

Upon the grain ration, thus supplemented by the ash, the three lots of chicks grew just as well, remained as healthy and made as good gains as did the three lots fed part animal food. The gain upon the ash-supplemented grains was made upon a little less food for each pound than that upon the other ration. Laying hens, also, upon this ration made equal in mineral matter, produced as great a weight of eggs as upon the animal meal ration for most of the time, but began to show a slight advantage for the animal food toward the end of the 30 weeks.

With ducklings, on the contrary, the addition of ash to the grains made this ration much better for them than the grains

alone had been, and reduced the difference in rate of gain between the rations ; but the animal meal ration was still best. The lot receiving the grains required nearly one-third more food for each pound of gain than the lot on the animal food.

In these tests 1000 chicks and 170 ducklings have been grown to marketable size, and 90 hens and 40 cockerels have been fed for lengthy periods ; so that the evidence has the weight of time and numbers. It all points in one direction : Toward superiority of rations containing animal food over those made up of grains alone. In no case has the reverse of this proven true, and in nearly all the trials the difference has been *most noticeable*. When the lack of mineral matter in an all-grain ration, as compared with one containing animal meal, is supplied by bone ash, the difference disappears or favors the grain ration ; so far as chicks and laying hens are concerned. That is, it is the small amount of ash in the grain ration which makes this ration inferior to one containing animal meal, rather than a difference in quality of the protein.

Practically, this is of little importance, for, except under rare conditions like those surrounding these experiments, it would be easier, cheaper and better to use animal meal, meat scraps or cut bone to supplement a ration for fowls in confinement, than to burn the bones or to buy bone ash. Something to supplement the ash-poor grains they must have and it is simpler to give it in a natural form, combined with valuable protein and fats, than to burn out the organic matter and give the ash only.

In farm poultry feeding, where the birds have the range of orchard and pasture, of course they get animal food in the insects and worms and snails which they scratch for so vigorously ; so grains may make up practically all the ration fed. The birds themselves will attend to the supply of animal food.

With ducks, however, even the addition of the bone ash did not make the grains a perfect feed. Ducks are naturally great lovers of small fish and frogs and snails and such forms of animal life found in their water excursions and unless they have something to take the place of this animal matter, they can not do their best.